UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,694	07/31/2003	Tomiji Tanaka	241069US6	7676

22850 7590 01/14/2005

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
LAVARIAS, ARNEL C	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 01/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H1A

Office Action Summary	Application No.	Applicant(s)	
	10/630,694	TANAKA ET AL.	
	Examiner	Art Unit	
	Arnel C. Lavarias	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 November 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendments to the specification of the disclosure in the submission dated 11/4/04 are acknowledged and accepted. In view of these amendments, the objections to the specification in Section 4 of the Office Action dated 8/5/04 are respectfully withdrawn.

2. The amendments to Claims 1-4, 10, 12-15, and 18 in the submission dated 11/4/04 are acknowledged and accepted.

Response to Arguments

3. The Applicants argue that, with respect to newly amended Claims 1 and 12, Long fails to teach or reasonably suggest a holographic recording apparatus and method, including a plurality of diffraction control elements configured to be moved in different directions before receiving a laser beam emitted from the laser source. The Examiner agrees, and respectfully withdraws the rejections of Claims 1-3, 9, 12-14 in Section 6 of the Office Action dated 8/5/04.

4. The Applicants further argue that, with respect to newly amended Claim 18, Long fails to teach or reasonably suggest a hologram recording medium for recording data as changes in refraction index of the recording medium. The Examiner notes that, although this limitation is not explicitly stated, such is implied since the holograms are recorded on a photosensitive material placed on a plate at the focal point of the reference and object beams (See 80, 81 in Figures 1-2). Incident light on the photosensitive material is

'recorded' as changes in refractive index, wherein the change in refractive index varies with the intensity of incident light.

5. The Applicant argues that, with respect to newly amended Claims 1 and 12, the combined teachings of Lewis and King et al. fail to teach or reasonably suggest a holographic recording apparatus and method, including a plurality of diffraction control elements configured to be moved in different directions before receiving a laser beam emitted from the laser source. The Examiner agrees, and respectfully withdraws the rejections of Claims 1-17 in Sections 9-11 of the Office Action dated 8/5/04.

6. The Applicant argues that, with respect to newly amended Claim 18, Lewis fails to teach or reasonably suggest a hologram recording medium for recording data as changes in refraction index of the recording medium. The Examiner notes that, although this limitation is not explicitly stated, such is implied since the holograms are recorded on a photosensitive material (See 73 in Figure 6). Incident light on the photosensitive material is 'recorded' as changes in refractive index, wherein the change in refractive index varies with the intensity of incident light.

7. Claims 1-18 are now rejected as follows.

Claim Objections

8. Claims 1-11 are objected to because of the following informalities:

Claim 1, line 8- insert 'of' after 'plurality'. Claims 2-11 are dependent on Claim 1, and hence inherit the deficiencies of Claim 1.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-3, 9-10, 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis (U.S. Patent No. 3677616), of record, in view of King et al. (U.S. Patent No. 6700686), of record, and Bloom et al. (U.S. Patent No. 5311360), of record.

Lewis discloses a holographic recording apparatus and method (See for example Figure 6), the apparatus and method both comprising a laser source emitting laser beams (See 11 in Figure 6); a plurality of diffraction control elements (See 27, 41 in Figure 6; col. 4, lines 19-42; col. 4, lines 59-64; col. 5, lines 21-32) receiving a laser beam emitted from the laser source and controlling a diffraction of the laser beam after being received but before letting the laser beam exit; and a diffracted light component blocking element (See 33, 35 in Figure 6; col. 4, lines 16-33) configured to block a predetermined diffracted light component in the diffracted light emitted from the plurality of diffraction control element. Lewis additionally discloses the plurality of diffraction control elements control a diffraction of the laser beam independently from each other (See col. 4, lines 19-42; col. 4, lines 59-64; col. 7, lines 9-24); a light dividing element (See 75 in Figure 6) for dividing a laser beam emitted from the laser source into first and second light beams and causing the first light beam to enter the plurality of diffraction control elements; a

second condensing element (See 83 in Figure 6) for condensing the second light beam emitted from the light dividing element onto a spot on the hologram recording medium where a laser beam emitted from the condensing element has been condensed; and the diffracted light blocking element blocking all orders of diffracted light except for two diffracted orders of light (i.e. the principle zero order and one other order of light) (See 33, 35 in Figure 6; col. 4, lines 19-58). Lewis lacks one or more condensing elements for condensing diffracted light component that has not been blocked by the diffracted light component blocking element onto a hologram recording medium (See 73 in Figure 6), and the plurality of diffraction control elements being configured to move in different directions. However, the use of focusing optics, such as one or more converging or condensing lenses, for focusing incident light down onto a holographic recording medium is well known in the art. For example, King et al. teaches a holographic storage apparatus for recording information into a holographic recording medium (See for example Figures 1-2; Abstract). In particular, object or signal light (See 225 in Figure 2) that has been encoded by a spatial light modulator (See 255 in Figure 1) is focused down to a spot on the holographic recording medium (See 250 in Figure 2) using at least one converging lens (See 280 in Figure 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the holographic recording apparatus and method of Lewis further include one or more condensing elements for condensing diffracted light component that has not been blocked by the diffracted light component blocking element onto a hologram recording medium, as taught by King et al., for the purpose of increasing storage capacity by utilizing less space

on the holographic recording medium for each recording. The combined teachings of Lewis and King et al. lack the plurality of diffraction control elements being configured to move in different directions. However, Bloom et al. teaches an alternative optical component, i.e. grating light valve, for use in spatial light modulator applications (See for example Figure 2, 10; Abstract; col. 1, line 17-col. 3, line 7; col. 3, line 31-col. 4, line 42). In particular, Bloom et al. teaches a grating light valve (See for example Figure 9) having individual control elements (See for example 66, 68, 70, 72 in Figure 10) having phase control elements (See for example each individual ribbon 18 in Figure 2) for controlling phase differences among output going light from each element, and the phase control elements being configured to move in different directions by an applied electrostatic force (See col. 6, lines 18-41). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the plurality of diffraction control elements be configured to move in different directions, as taught by Bloom et al., in the apparatus and method of Lewis and King et al., for the purpose of providing fast, controlled, and automated adjustments to the phase of the outgoing light.

11. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis in view of King et al. and Bloom et al.

Lewis in view of King et al. and Bloom et al. discloses the invention as set forth above in Claims 1 and 10, except for a light blocking element for blocking the first light beam emitted from the light dividing element; and a light receiving element for receiving light emitted from the hologram recording medium on the basis of the laser beam converged onto the hologram recording medium by the second condensing element. It is noted that

the use of shutters or the SLM itself for blocking the object beam during readout or reconstruction of the hologram is well known in the art. Further, it is known in the art to utilize a light receiving element, such as a CCD camera or photodetector array to receive the holographic information that is reconstructed when only the reference beam is incident on the holographic recording medium. See for example Figure 2; 250, 284, 286 in Figure 2; col. 6, lines 20-67 of King et al.). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the holographic recording apparatus and method of Lewis in view of King et al. and Bloom et al. further include a light blocking element for blocking the first light beam emitted from the light dividing element; and a light receiving element for receiving light emitted from the hologram recording medium on the basis of the laser beam converged onto the hologram recording medium by the second condensing element, for the purpose of reducing the number of optical systems, and hence cost, required for recording and reconstructing a hologram (i.e. only a single shared optical system is required, instead of two separate optical systems).

12. Claims 4-8, 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis in view of King et al. and Bloom et al.

Lewis in view of King et al. and Bloom et al. discloses the invention as set forth above in Claims 1-3, 12-14, except for the modulator and object transparency of Lewis (or the SLM of King et al.) being a grating light valve. However, as previously noted above, Bloom et al. teaches grating light valve for use in spatial light modulator applications (See for example Figure 2, 10; Abstract; col. 1, line 17-col. 3, line 7; col. 3, line 31-col. 4,

line 42). In particular, Bloom et al. teaches a grating light valve (See for example Figure 9) having individual control elements (See for example 66, 68, 70, 72 in Figure 10) having first and second phase control elements (See for example each individual ribbon 18 in Figure 2) for controlling phase differences among output going light from each element; the outgoing light beams from the first and second control elements being diffracted light beams that have been diffracted by the first and second control elements (See col. 6, lines 18-47); the first and second phase control elements being ribbon shaped (See 18 in Figure 2); and the either the first or the second phase control elements being displaced by an electrostatic force (See col. 6, lines 18-41). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the modulator and object transparency of Lewis (or the SLM of King et al.) be a grating light valve, as taught by Bloom et al., to take advantage of the high efficiency, high contrast, low cost of manufacturing, and direct integration with electronics of the grating light valve over other existing SLM's.

13. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Long (U.S. Patent No. 5986781), of record, in view of Hariharan (P. Hariharan, 'Optical Holography- Principles, techniques, and applications', Cambridge University Press, Cambridge, 1996, pp. 85, 114-115.).

Long discloses a recording medium (See 80, 81 in Figures 1-2) for recording data by using diffracted light obtained by blocking a predetermined diffracted light component in diffracted light emitted from a diffraction control element that controls the diffraction of a laser beam before letting the laser beam exit. Long lacks recording data as changes in

refraction index of the recording medium. However, as is known in the art of holography, and as noted by Hariharan, the recordation of a hologram in a holographic recording medium requires that the holographic recording medium be responsive to the incident light with a change in its optical properties, e.g. a change in its absorption coefficient, a change in its refractive index, or a change in its thickness. In the instant case, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the system of Long record data as changes in refraction index of the recording medium, as is known in the art and further evidence by Hariharan, to take advantage of the higher diffraction efficiencies provided by refractive index based holograms over amplitude based holograms.

14. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis in view of Hariharan.

Lewis discloses a recording medium (See 73 in Figure 6) for recording data by using diffracted light obtained by blocking (See 33, 35 in Figure 6; col. 4, lines 16-33) a predetermined diffracted light component in diffracted light emitted from a diffraction control element (See 27 in Figure 6; col. 4, lines 19-42) that controls the diffraction of a laser beam (See 11 in Figure 6) before letting the laser beam exit. Lewis lacks recording data as changes in refraction index of the recording medium. However, as is known in the art of holography, and as noted by Hariharan, the recordation of a hologram in a holographic recording medium requires that the holographic recording medium be responsive to the incident light with a change in its optical properties, e.g. a change in its absorption coefficient, a change in its refractive index, or a change in its thickness. In the

instant case, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the system of Lewis record data as changes in refraction index of the recording medium, as is known in the art and further evidence by Hariharan, to take advantage of the higher diffraction efficiencies provided by refractive index based holograms over amplitude based holograms.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent Application Publication US 2004/0156083 A1 to Sugiki et al.

Sugiki et al. is being cited to evidence a similar holographic recording and reproduction optical system (See for example Figure 1), wherein the system also utilized a grating light valve as the phase modulation element (See 9 in Figure 1; Figure 7). However, Sugiki et al. is unavailable as prior art to the instant application since it was filed after the instant application.

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 8:30 AM - 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Arnel C. Lavarias
1/10/05

THONG NGUYEN
PRIMARY EXAMINER
GROUP 2800